CHAPTER 15. NET NATIONAL EMPLOYMENT

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Net national employment impacts from water heater efficiency standards are defined as net jobs created or eliminated in the general economy as a consequence of: (1) reduced spending by end users on energy (electricity, gas, oil, and LPG); (2) reduced spending on new investment or capacity by energy companies; (3) increased spending on the purchase of new water heaters; (4) increased spending on the installation of new water heaters; and (5) the associated indirect effects of those four factors throughout the national economy.

Figure 15.1 shows the estimated net national employment impacts of four different trial standard levels. These trial standard levels are discussed in greater detail in the analyses of Shipments (Chapter 11) and National Energy Impacts (Chapter 12). Figure 15.1 shows, for any given year, the change in the number of jobs in the economy relative to the number of jobs if there were no change in standards (and thus no resulting change in spending and cash flow patterns throughout the economy). Table 15.1 shows the net national employment impact in specific years.

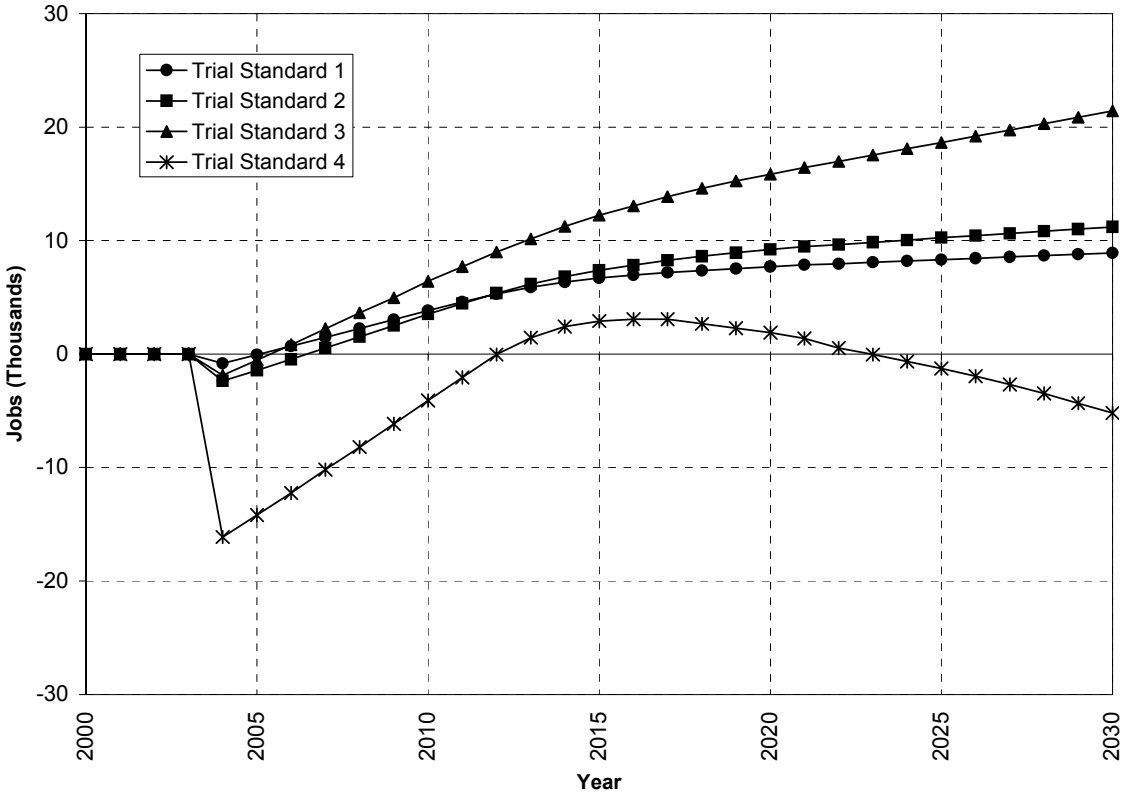

Figure 15.1 Net National Employment Impacts

Table 15.1 Net National Change in Jobs

Trial Standard Level	2010 (thousands)	2020 (thousands)	2030 (thousands)
1	3.8	7.7	8.9
2	3.5	9.2	11.2
3	6.4	15.8	21.4
4	-4.1	1.9	-5.2

These results are based on an input/output model of the U.S. economy that estimates the effects of standards on major sectors of the economy related to buildings and the net impact of standards on jobs. The model, ImBuild, was developed for DOE's Office of Building Technology, State and Community Programs.[1] ImBuild (which stands for Impact of Building Energy Efficiency Programs) was created by the Pacific Northwest National Laboratory as a special-purpose version of the IMPLAN national input-output model. It was developed to estimate the employment and income effects of building energy technologies. In comparison with simple economic multiplier approaches, ImBuild allows for more complete and automated analysis of the economic impacts of energy-efficiency investments in buildings.

Energy-efficiency technology affects the U.S. economy primarily through three mechanisms. First, if the incremental costs of the new technology per installed unit are different from those of the conventional technology, changes in purchases will occur in the sectors involved in manufacturing, distribution, and installation for both technologies, which will change the overall mix of economic activity. Second, depending on how the efficiency investment is financed, it may "crowd out" other domestic savings, investments, and consumer spending, somewhat reducing overall economic activity. Third, energy expenditures will be reduced. On one hand, this reduction lowers final demand in the electric and gas utility sectors (and the fuel oil production and distribution sector) as well as in the trade and services sectors that provide maintenance, parts, and services for the utility and fuel sectors. On the other hand, it increases net disposable household income and increases general consumer spending in all sectors (including some increases in expenditures for electric and gas utility services and retail trade and services).

ImBuild is written in Visual Basic and Excel. It uses a 35-sector model of the national economy to predict the economic effects of residential and commercial buildings technologies. It has a user-friendly, menu-driven front end to facilitate input. ImBuild collects user-supplied estimates of initial investments, energy savings, and economic activity associated with spending of the savings resulting from standards (changes in final demand in personal consumption, business investment, and government spending) and provides overall estimates of the change in national output for each input-output sector. Then, the model applies estimates of employment and wage income per dollar of economic output for each sector and calculates impacts on national employment and wage income.

ImBuild calculates the total effect of standards on employment, including job creation or deletion in the manufacturing sector. Direct employment impacts, i.e., those that would occur at water heater manufacturing plants, are discussed in the Manufacturer Impact Analysis (Chapter 13).

Figure 15.1 shows the cumulative net increase or decrease in jobs resulting from water heater efficiency standards for each year to the year 2030. The greatest number of jobs is created for Trial Standard Level 3 with 21,000 more jobs in 2030 when compared to the no-standards base.

In an input/output model, the level of employment in an economy is determined by the relationship of different sectors of the economy and the spending flows among them. Different sectors have different levels of labor intensity and so changes in the level of spending (e.g., such as the effects of an efficiency standard) in one sector of the economy will effect flows in others, which effects the overall level of employment.

Jobs are created when the net change in spending flows into more job-intensive sectors relative to the base case; jobs are lost when the net change in spending flows into less job-intensive sectors relative to the base case. An energy-efficiency standard for water heaters will create such changes in the spending flows of the economy. Standards will reduce water heater operating costs, which will in turn increase the amount of disposable income to consumers. There are two basic reasons why energy cost savings (driving job creation) increase after a standard is implemented: (1) households buy higher-efficiency water heaters compared to the base-case scenario and (2) the total number of water heaters in the country increases over time, generating a greater potential for energy savings. These water heaters are bought by consumers who would have bought a lower-efficiency water heater if a higher-efficiency standard were not implemented.

A standard may also increase purchase price (reducing disposable income to consumers) and increase the demand for capital in the water heater manufacturing industry. The water heater manufacturing industry is more capital-intensive than average, so an increase in spending flows to it will initially tend to reduce the employment level in the overall economy.

Figure 15.1 can be divided into three general sections:

a. During the first few years of a new standard, the increased costs of buying more efficient water heaters are greater than the dollar savings in energy. In Figure 15.1, this is reflected as a net decrease in jobs between 2004 and 2006 for trial standard levels 1 through 3. This effect extends to 2012 under trial standard level 4.

b. Once the initial costs are recovered through energy savings, the dollars saved in expenditures on energy are available to buy other goods in the economy, thereby increasing jobs. The net national employment curve is steepest for the first dozen years (the lifetime of a water heater), during which time there is both a growth in the total stock of water heaters as well as an increase in the saturation of water heaters of higher efficiency.

c. After 2015, even though the total stock of water heaters continues to increase, the growth in net employment stabilizes because at that point all of the water heaters being replaced in the standards case are water heaters that are already high-efficiency (instead of replacing baseline water heaters with high-efficiency ones). Under trial standard level 4, the shift to electric water heaters in new construction means energy savings are not sufficient to offset the increased equipment costs and net employment starts to decline again.

The impact on jobs has been disaggregated into the component effects. Figure 15.2 shows the impact on jobs of consumer energy savings. When more consumers save money by using efficient water heaters, they have more money to spend in other more labor-intensive sectors of the economy; this results in a net increase in jobs throughout the economy.

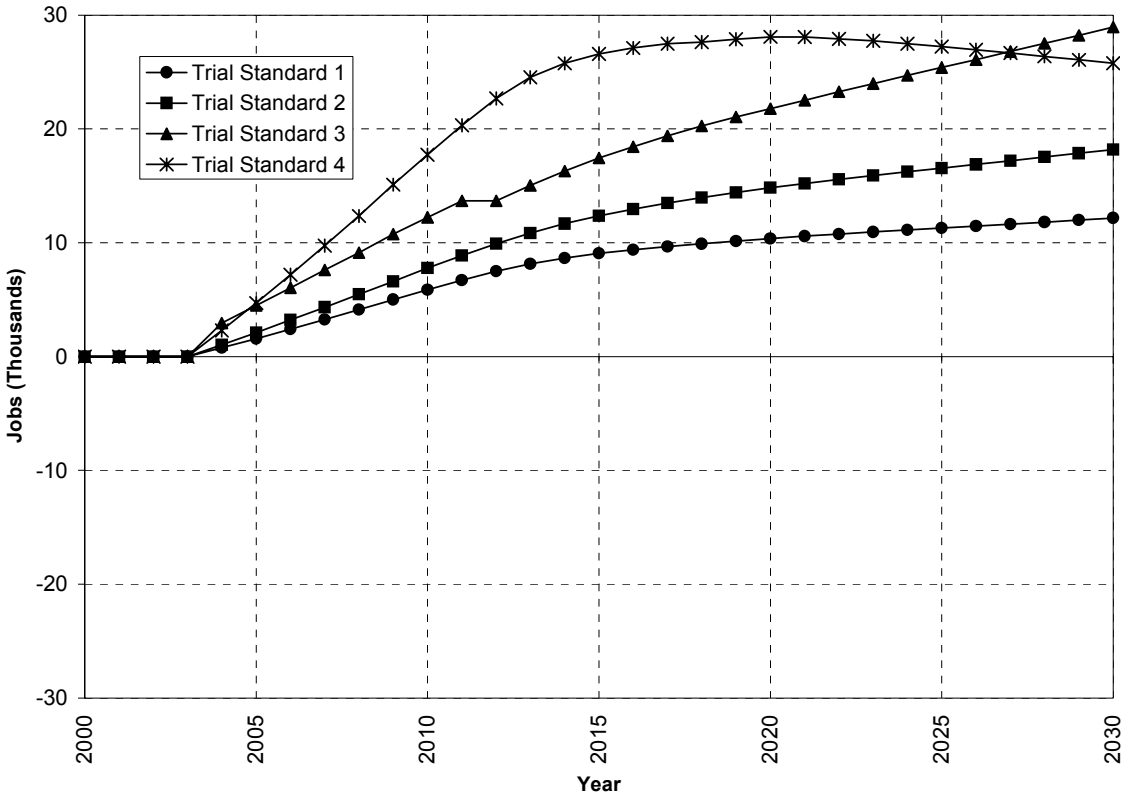

Figure 15.2 Employment Impacts of Consumer Savings

The employment impacts of consumer energy savings are largest for Trial Standard Level 3, with a cumulative increase of 29,000 jobs in 2030.

Figure 15.3 shows the employment impacts of the increased first cost of more efficient water heaters. This higher first cost is reflected in the decrease in jobs shown in the figure. Because manufacturing is capital-intensive, less investment capital is available for other purposes. Trial Standard Levels 1 shows a loss of less than 3,000 jobs in 2030 because of the increase in equipment price. Trial Standard Levels 2 and 3 show a loss of about 6,000 jobs in 2030. Trial Standard Level 4 shows a loss of more than 30,000 jobs in 2030.

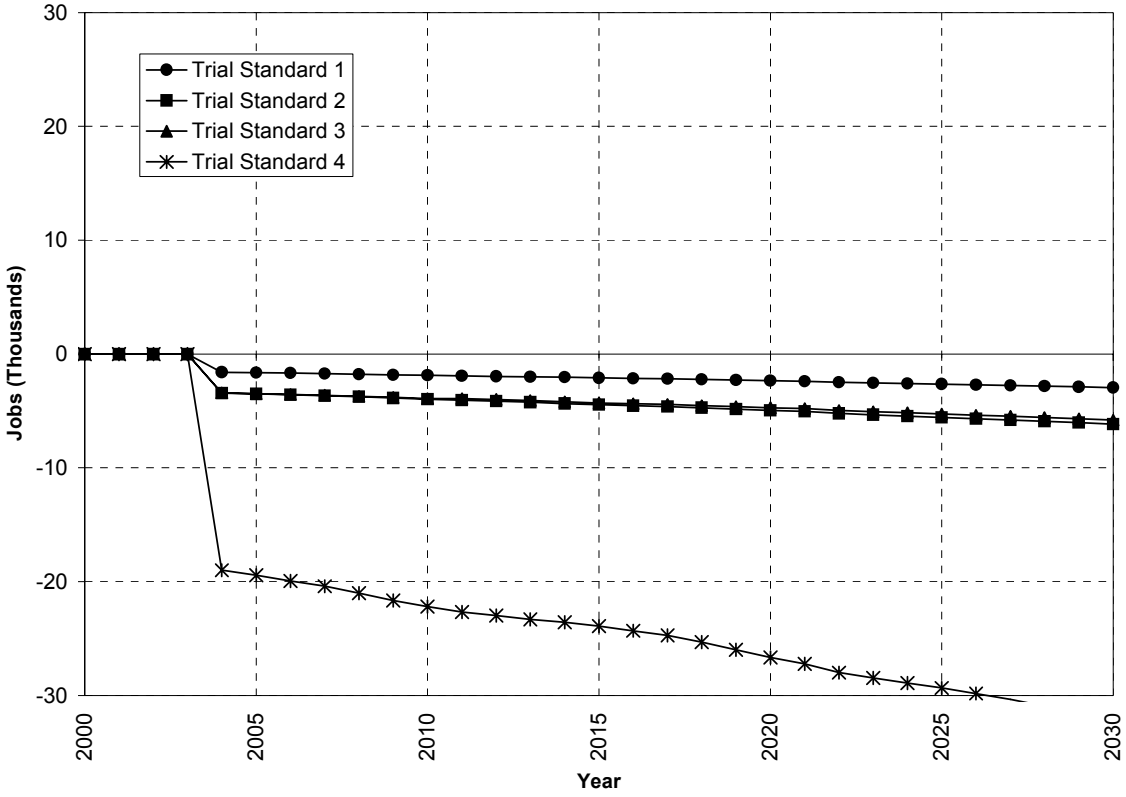

Figure 15.3 Employment Impacts of Equipment Price

There is a significant increase in installation costs from energy-efficiency standards. However, the impact on jobs is surprisingly small. Cumulative job increase because of increased installation costs in 2030 is projected to be about 1,000 jobs for Trial Standard Level 4. This is shown in Figure 15.4. The scale in this figure is the same as in the other employment impact charts to show the relative size of this impact.

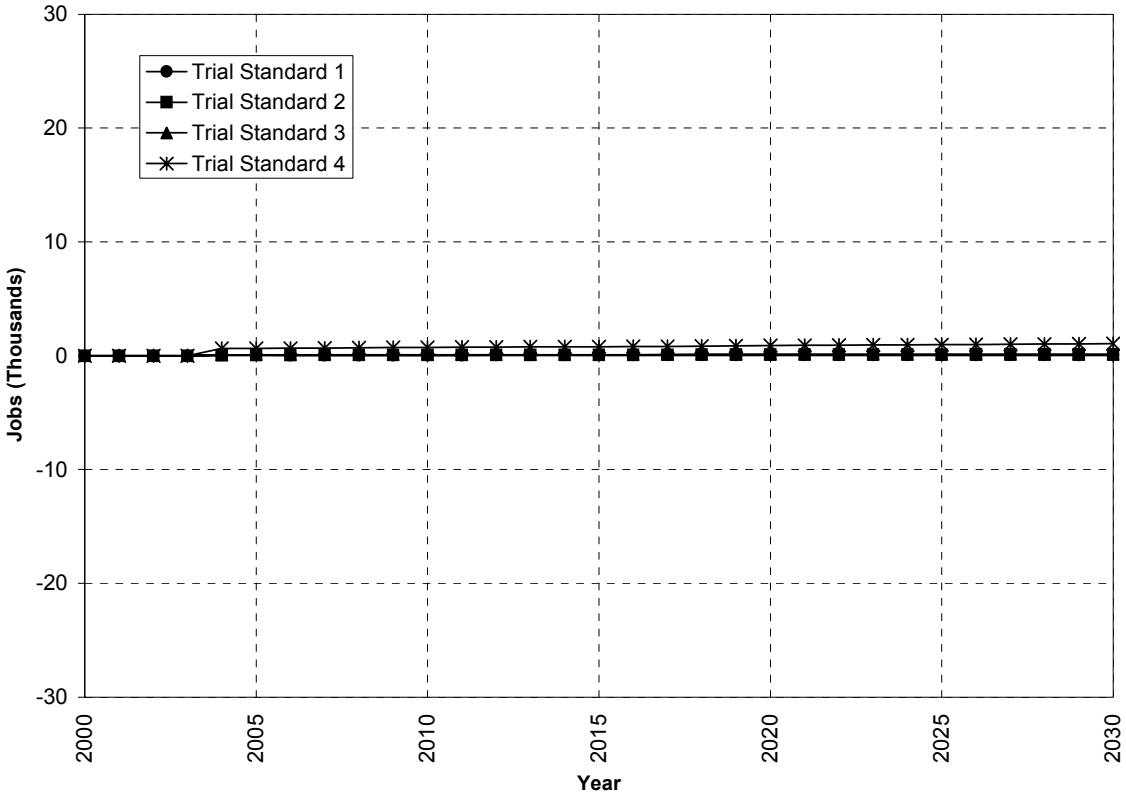

Figure 15.4 Employment Impacts of Installation Cost

Figure 15.5 shows the decrease in employment resulting from energy savings. When consumers use less energy, the electric and gas utilities (and fuel oil production and delivery companies) experience relative reductions in demand. Reduced demand results in less investment in new capacity and hence lower employment in these sectors. The effect on jobs because of the impact on utilities is also small. The impact on utilities causes a net loss of 1800 jobs for Trial Standard Level 3.

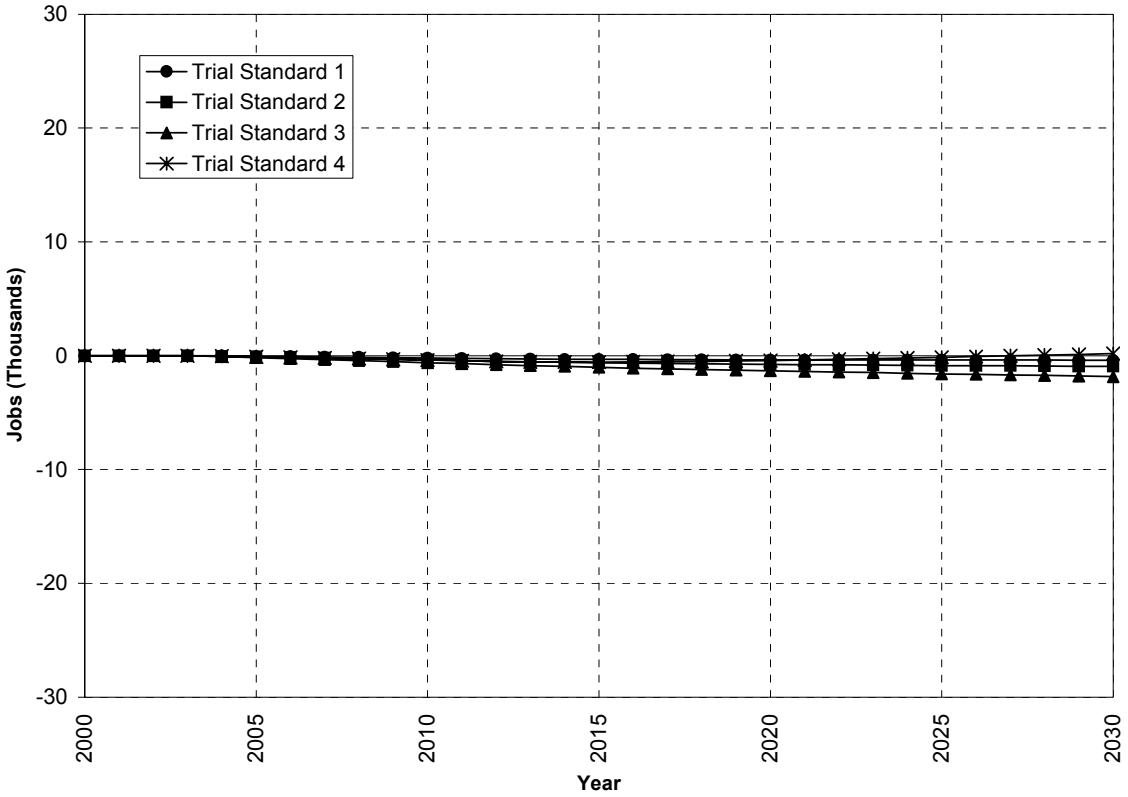

Figure 15.5 Employment Impacts of Utility Impacts

The energy savings for each of the fuel sources are shown in the National Energy Impacts results (Chapter 12).

Figures 15.1 through 15.5 are all based on future energy prices as projected in the *Annual Energy Outlook 2000* (*AEO2000*).[2] In addition to its reference scenario, which was used above, the *AEO2000* includes a "high growth" and "low growth" scenario for future energy prices. We also estimated the net national employment impacts for the four different standard levels using these two alternative scenarios for future energy prices. Figures 15.6 and 15.7 show the net employment impacts for the high and low growth scenarios, respectively.

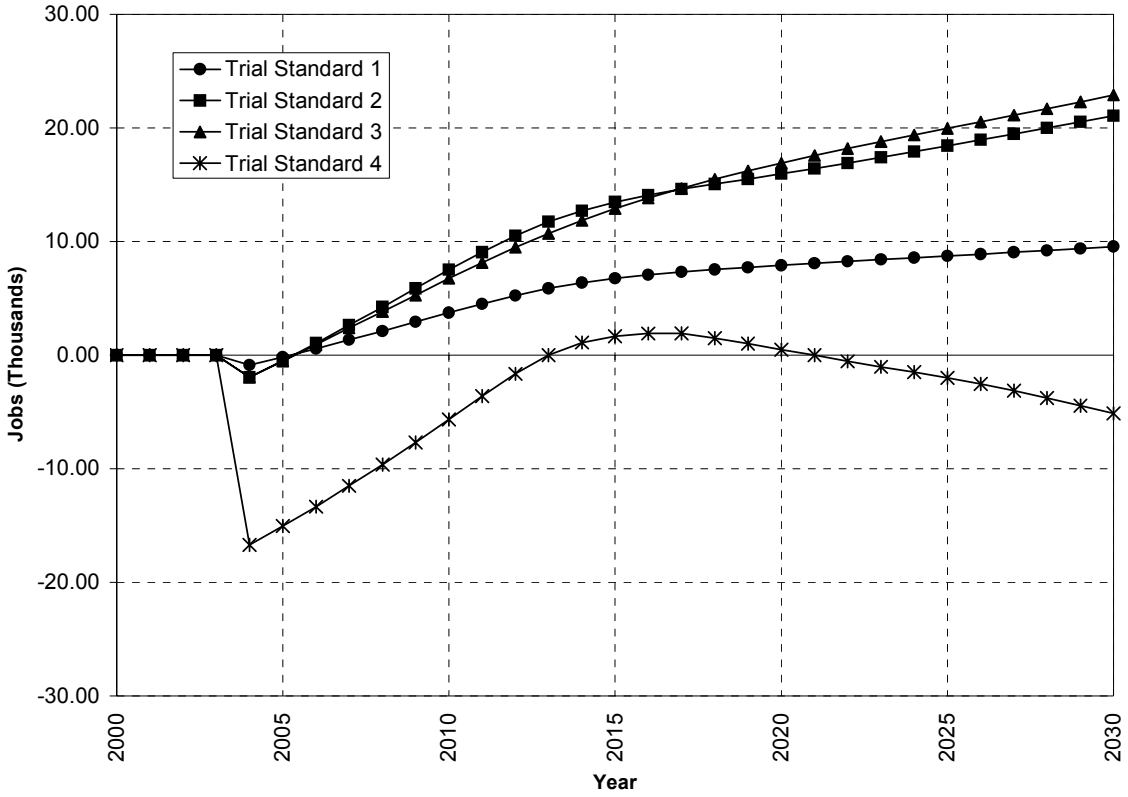

Figure 15.6 Net National Employment Impacts, *AEO2000* High Growth

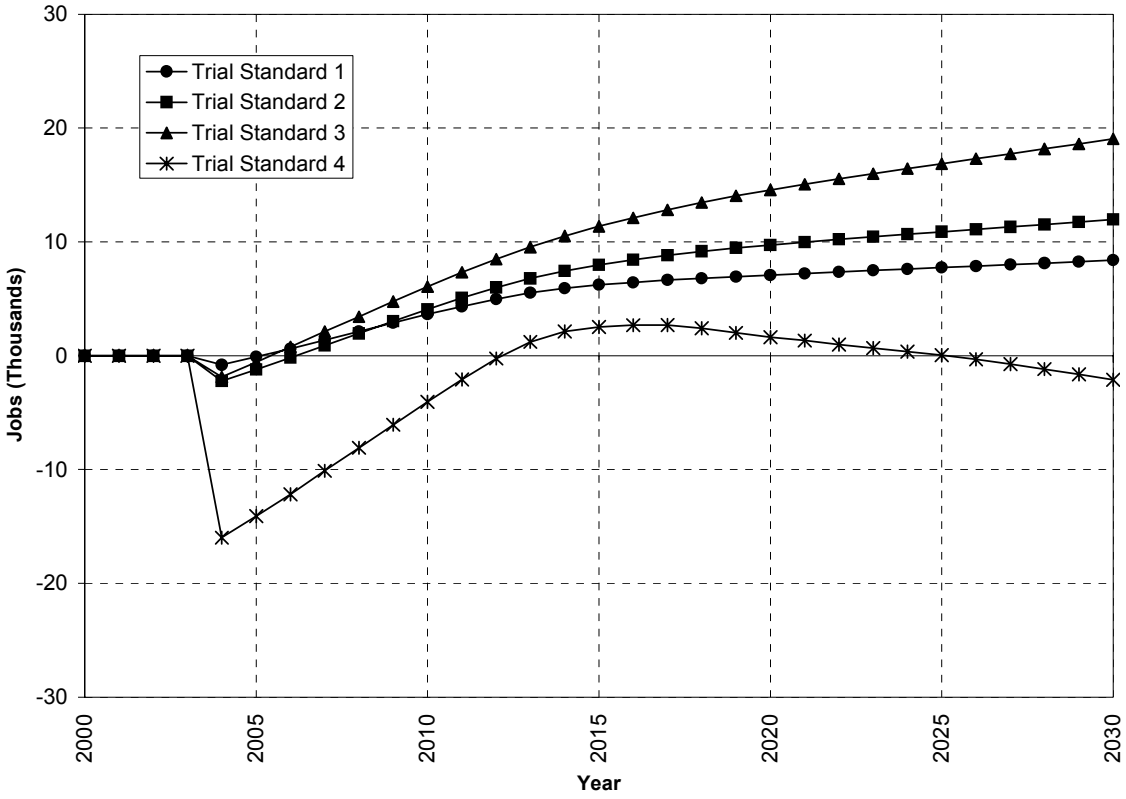

Figure 15.7 Net National Employment Impacts, *AEO2000* Low Growth

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1. Scott, M. J., D. J. Hostick, and D. B. Belzer, *ImBuild: Impact of Building Energy Efficiency Programs,* April, 1998, Pacific Northwest National Laboratory. Richland, WA. Prepared for the U.S. Department of Energy under Contract DE-AC06-76RLO 1830. Report No. PNNL-11884.

2. U.S. Department of Energy - Energy Information Administration, *Annual Energy Outlook 2000: With Projections Through 2020,* December, 1999. Washington, DC. Report No. DOE/EIA-0383(2000). <http://www.eia.doe.gov/oiaf/aeo/>